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SNOWFALL AND WATER EQUIVALENT.

By Prof. H. C. FRANKENFIELD.

While the extremely important influence of melting snows upon the spring floods has been always fully appreciated, no systematic attempts to accurately determine their effect were made by the Weather Bureau until the present spring. For several years past Mr. Charles A. Mixer, Resident Engineer of the Rumford Falls Power Company at Rumford Falls, Me., has made measurements of the water equivalent of the accumulated winter snow, and the results from 1899 to 1903, inclusive, were communicated in a very interesting paper that appeared in the MONTHLY WEATHER REVIEW for April, 1903.

No other reports of observations were received until March of this year, when Mr. J. L. Dean, of the Hollingsworth and Whitney Company, of Winslow, Me., and Special River Observer of the Weather Bureau, made two measurements in the birch and pine brush at Winslow. On March 1 the depth of snow in the brush was 32 inches and the water equivalent 8 inches. At the same time the depth of snow in the open was 18 inches. On March 15 the depth of snow in the brush was 27 inches and the water equivalent 7.5 inches; depth of snow in the open, 15 inches.

During the winter just ended nine stations in the watershed of the Red River of the North were equipped with apparatus for measuring accumulated snowfall and its water equivalent. Observations were made on Monday morning of each week and telegraphed to the district center at Moorhead, Minn., but the snowfall during the winter was so light that no results of value were obtained. However, observations will be

continued and the service extended as far as possible into the northern rivers, and particularly into the headwaters of mountain streams in the extreme West.

EARTHQUAKE OF MARCH 21, 1905.

By Prof. CHARLES F. MARVIN.

The table below contains the details of the record of an earthquake made on the Omori seismograph at the Weather Bureau, Washington, D. C., at 10 hrs., 59 mins., 32 secs., p. m. (seventy-fifth meridian time) of March 21, 1905.

The record was very clearly defined, and the waves were particularly simple and sinusoidal in character throughout. It appears that the preliminary tremors were of exceedingly long duration, especially as compared with the principal portion of the earthquake. If we had included a series of small waves of regular character which preceded the larger waves actually regarded as making up the principal portion, the duration of the latter might have been made about two minutes longer. However, the smaller waves seemed more properly to belong to the second preliminary tremors.

Earthquake of March 21, 1905, seventy-fifth meridian time.

	h.	m.	s.	
First preliminary tremors began	10	59	32	p. m.
Second preliminary tremors began	11	12	42	p. m.
Principal portion began	11	24	06	p. m.
Principal portion ended	11	26	17	p. m.
End of earthquake (a. m., March 22)	0	13	12	a. m.

Duration of first preliminary tremors	13 min.	12 sec.
Duration of second preliminary tremors	11 "	24 "
Duration of principal portion	2 "	11 "
Whole duration of earthquake 1 hr.	13 "	40 "

Average complete period of 5 long uniform waves, at beginning of second preliminary tremors	30 sec.
Average complete period of 8 uniform waves at end of second preliminary tremors	15.6 "
Average complete period of 7 uniform, strong waves, constituting the principal portion	15.6 "
Period of pendulum	28.0 "
Magnification of record	10 times.
Maximum double amplitude of actual north-south displacement of the earth at seismograph	0.35 mm.

The north and south component of horizontal motion only was recorded.

THE VARIATIONS IN ATMOSPHERIC TRANSPARENCY DURING 1902, 1903, AND 1904.

By HERBERT HARVEY KIMBALL, Librarian and Climatologist, U. S. Weather Bureau.

In the Proceedings of the Third Convention of Weather Bureau Officials, pp. 69–77,[1] are given some results of observations made by me on the quantity of solar radiation received at the surface of the earth, and on the polarization of blue sky light, during 1902, 1903, and 1904. In another column of the current REVIEW Miss R. A. Edwards has given a translation of E. Marchand's account of similar observations covering the same period, supplemented with observations of certain optical phenomena, and made at Pic du Midi and Bagnères, in the Pyrenees, France. A comparison of certain features of these two series of observations is of interest.

In the Pyrenees a diminution in the amount of solar radiation received at the earth's surface was noted at intervals after May 27, 1902. This diminution became permanent in January, 1903, at which time it amounted to 20 per cent of the normal radiation. It reached 50 per cent on the 21st and 22d of the following month, and was quite marked until August of that year, when it amounted to about 10 per cent, after which it gradually diminished, but was noticeable at times up to the end of 1904.

The blueness of the sky suffered a diminution of three units, measured on a scale of 0 to 50.

In my paper above referred to it is stated that—

I was surprised at the small value of the solar radiation received at the surface of the earth during January, February, and March, 1903, but particularly during March.

Also furthermore,

From January, 1903, to March, 1904, inclusive, there was a marked deficiency in the radiation measurements as compared with similar measurements made by Mr. Harvey N. Davis at Providence, R. I., in 1892,[2] amounting in some months to as much as 30 per cent, and in others to less than half this amount.

Since these observations were not all made at one station, they are not strictly comparable; but since Providence, the most northern station, generally gave the largest radiation values, the diminution in radiation as measured in 1903 and 1904 can hardly be attributed to local conditions.

The observations with the Pickering polarimeter, made at Asheville and Black Mountain, N. C., from December, 1902, to March, 1903, inclusive, and at Washington, D. C., from May, 1903, to date, may be compared without considering the discrepancy due to latitude that applies to pyrheliometer observations, although local conditions must also have an effect upon polarimeter observations.

There is a wide variation in the polarization of blue sky light from day to day, even when no clouds are present. I have therefore selected the observations showing the maximum polarization for each month, for comparison in the following table:

Maximum percentage of polarization of blue sky light during each month at a point on the vertical circle passing through the sun, and 90° from the latter.

Month.	1902.	1903.	1904.	1905.	Month.	1902.	1903.	1904.	1905.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
January	.....	51.8	54.1	59.9	July	.....	47.5	61.8	.....
February	.....	53.2	51.6	55.6	August	.....	.....	.....	.....
March	.....	47.4	53.2	61.1	September	.....	54.6	59.7	.....
April	.....	.....	53.0	.....	October	.....	54.6	64.7	.....
May	.....	43.4	54.7	.....	November	.....	57.6	.....	.....
June	.....	37.6	58.9	.....	December	55.7	52.6	62.9	.....

No observations for the months left blank.

Since in general the blueness of the sky and the amount of solar radiation measured at the surface of the earth are proportional to the percentage of polarization of the blue sky light, it is not difficult to trace in the above table the diminution in atmospheric transparency that became marked in the Pyrenees in January, 1903, continued until the following August, and has gradually become less noticeable since that date.

The observations here compared are but two series out of many that show a diminution in the transparency of the atmosphere during 1903, plausibly due to the presence of volcanic dust in the atmosphere. A summary of other observations may be found in my paper in the proceedings of the convention already referred to.

It is a strange coincidence that the observations at the Astrophysical Observatory of the Smithsonian Institution indicate that during 1903 and 1904 not only did the solar radiation suffer unusual absorption in the earth's atmosphere, but the absolute amount received at the outer surface of the earth's atmosphere was less than usual.[3] Naturally the question arises as to the possible relation between these two phenomena. The bolometric observations to be made on Mount Wilson, Cal., during the coming summer, by Professor Langley and Mr. Abbot will no doubt shed much light on this subject.

[1] Variations in insolation and in the polarization of blue sky light during 1903 and 1904. By H. H. Kimball. (Proceedings of the Third Convention of Weather Bureau Officials at Peoria, Ill., September 20, 21, 22, 1904. Washington, 1904.

[2] Observations on solar radiation with the Ångström pyrheliometer, Monthly Weather Review, June, 1903, Vol. XXXI, p. 275.

[3] See Langley, S. P. On a possible variation of the solar radiation and its probable effect on terrestrial temperatures. (Astrophysical Journal, Chicago. Vol. 19. p. 305–321.)